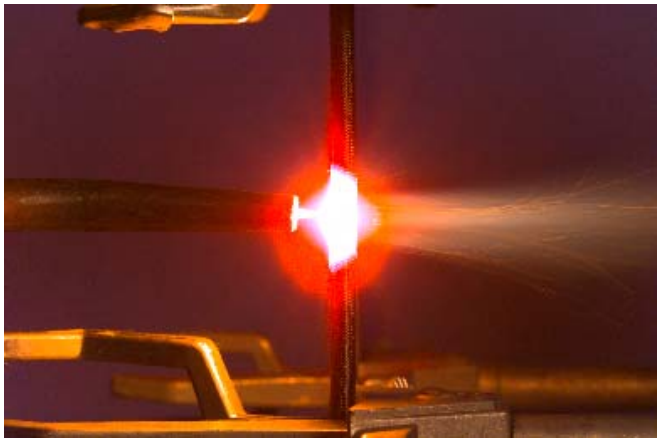
NASA Glenn Success Stories

Thermal Barrier/Seal for Extreme Temperature Applications

Alliant TechSystems/Thiokol Propulsion

TECHNOLOGY

A new braided carbon fiber thermal barrier has been developed - and is being certified for flight - that would protect critical nozzle joints and O-ring seals in the Space Shuttle reusable solid rocket motors. The new thermal barrier reduces the temperature of the 5500°F rocket combustion gas and permits only relatively cool (<200 °F) gas to reach the O-rings. This important new technology improves on already high Shuttle safety margins and enables solid rocket motor joint assembly in significantly less time (approximately one-sixth the time) as compared to the previous joint fill compound approach with much higher degrees of reproducibility. Full-scale solid rocket motor test results showed that the thermal barrier protected the downstream O-rings even when intentional flaws were cut into the barrier.



5500 °F oxyacetylene torch flame on thermal barrier

COMMERCIAL APPLICATIONS

- Potential commercial applications include:
  - Sealing glands of processing equipment in chemical industry
  - Sealing furnace doors to prevent leakage of potentially dangerous super-heated gases
  - Sealing graphitization furnaces used in carbon electrode production where temperatures reach 3000+°F
  - Sealing high temperature interfaces/gaps between nuclear fuel rods

SOCIAL / ECONOMIC BENEFIT

- Designers of solid rocket motors and special purpose industrial equipment have new, effective means of limiting the flow of extreme temperature gases
- Maintains current high Shuttle and astronaut safety standards and enables solid rocket motor joint assembly in one-sixth the time of previous approaches with much higher degrees of reproducibility

NASA APPLICATIONS

- Principal application: Thermal barrier in Space Shuttle solid rocket motor nozzle joints (Re-designed joints incorporating the thermal barriers are scheduled to enter service on a Space Shuttle mission in early 2005.)
- Other U.S. government missions that could utilize this technology include:
  - Structural joints in expendable solid rocket motors for large space launch vehicles
  - All future solid rocket motors assembled from multiple segments

NASA Contacts: Dr. Bruce Steinetz (216) 433-3302,
Pat Dunlap (216) 433-3017
Thiokol Contact: Paul Bauer (435) 863-2356